📘 Study Unit 1: C.1 — Introduction to Cost and Variance Measures

🌞 Variance Analysis

- **Definition:**
  Process of comparing actual results (revenues and expenses) with budgeted amounts for a period.
- **Purpose:**
  Identifies where and why differences (variances) occur so management can take corrective action.

⚙️ Management by Exception

Concept:
Only significant variances are reported to management for investigation.

Benefits:

1. Management focuses on problem areas (unfavourable variances).
2. Investigation of favourable variances can reveal best practices.

Limitations:

1. Small but negative trends might be ignored.
2. Too many variances → confusion and inefficiency.
3. Ignoring favourable variances can miss improvement opportunities.

🪨 Standard Costs

- **Definition:**
  Predetermined estimates of costs for direct materials, labour, and overhead to produce one unit.
- **Purpose:**
  Acts as a benchmark (target) to measure actual performance.
- **Set Before:**
  Each accounting period, based on expected costs and production levels.

Standard Cost ≠ Standard Cost System

- **Standard Cost:** Expected (budgeted) cost per unit.
- **Standard Cost System:** Accounting system that records transactions at standard cost and tracks variances in the general ledger.

A **Standard Cost System** is an accounting framework that:

- Records **transactions at standard cost** (predefined estimates for materials, labor, and overhead)
- Tracks **variances** between actual and standard costs in the **general ledger**

⚙️ Key Components

- **Standard Costs**: Budgeted cost per unit for direct inputs, set before the period begins
- **Variance Analysis**: Differences between actual and standard costs, used to evaluate performance
- **General Ledger Integration**: Variances are recorded in dedicated accounts for analysis and control

🧠 How It Works

Step	Description
1️⃣ Set Standards	Based on expected input quantities and prices
2️⃣ Record Transactions	Use standard costs instead of actual costs
3️⃣ Calculate Variances	Compare actual vs standard costs
4️⃣ Analyze & Adjust	Investigate significant variances for corrective action

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🏭 Using a Standard Cost System

- Can be used in both:
  1. **Process Costing** (mass production, uniform products)
  2. **Job-Order Costing** (customized or client-specific jobs)

Reasons for Adoption:

1. Simplifies cost allocation (especially in process costing).
2. Makes calculation of cost per equivalent unit easier.
3. Simplifies recordkeeping for cost control and reporting.

Best Used With:
A **Flexible Budgeting System** — adjusts for actual activity levels, giving more accurate variance analysis.

📊 Flexible Budget

- Budget prepared using **standard costs per unit** and **actual activity levels**.
- Shows what the budget *would have been* if actual activity levels were known in advance.
- Helps separate quantity-related differences from price/cost-related variances.

🎂 Determining the Level of Activity for Standard Costs

Costs depend on **activities (cost drivers)** → manage activities, not just costs.

Examples of cost drivers:

- Direct labor hours, machine hours, units produced, etc.

Standards Should Be:

- **Challenging but attainable** under normal conditions.

Overhead Standards:

- Based on normal conditions and anticipated volume.
- Use **budgeted factory overhead ÷ standard level of activity = standard overhead rate.**

📈 Levels of Output Used for Standards

This refers to the production volume assumptions a company uses when setting standard costs—especially for allocating fixed manufacturing overhead and evaluating performance.

Type of Output Level	Description	Use
Ideal/Theoretical	No downtime, max efficiency	Unrealistic long-term
Practical (Currently Attainable)	Allows normal downtime and learning	Motivational, realistic
Normal	Average expected output over several years	Used for controlling costs
Master Budget Capacity	Planned capacity for next budget period	Used for annual planning

FASB Requirement:
Fixed overheads should be allocated based on **normal capacity**.

🔁 Review of Standard Costs

- Must be reviewed and updated regularly because:
  - Input prices change
  - Efficiency levels change
  - Technology or processes evolve

🎯 1. Sources of Standards

When setting standard costs (for price, usage, or efficiency), companies can use various **information sources** to ensure accuracy, realism, and alignment with strategy.

🔹 A. Activity Analysis

Definition:
A detailed study identifying and evaluating all activities required to complete a job or operation efficiently.
Involves cross-functional participation — **engineers, management accountants, and production workers**.

Steps:

1. Identify all necessary activities.
2. Outline steps to complete each activity.
3. Evaluate efficiency of each step.

Participants:

- Product Engineers → specify components
- Industrial Engineers → analyze procedures
- Management Accountants → coordinate and evaluate costs

✅ **Benefits:**

- Most precise way to determine standard costs (if executed properly).

⚠️ **Limitations:**

- Time-consuming and costly process.

🔹 B. Historical Data

Definition:
Using reliable past cost data for similar products to establish standard costs.

✅ **Benefits:**

- Inexpensive and easy to implement.
- Based on real operating experience.

⚠️ **Limitations:**

- May perpetuate past inefficiencies.
- Conflicts with *continuous improvement (kaizen)* philosophy.

🔹 C. Benchmarking

Definition:
Using **industry best practices** or **data from similar companies** to set standards.
Sources: Industry associations, trade groups, benchmarking databases.

✅ **Benefits:**

- Encourages performance matching with top competitors.
- Helps maintain a competitive edge.

⚠️ **Limitations:**

- Benchmarked data might not fit the company's specific situation.

🔹 **D. Target Costing**

Definition:
Standards are set *backward* from the market price and desired profit margin.
Formula:
👉 **Target Cost = Target Selling Price – Desired Profit Margin**

Features:

- Market-driven approach.
- Focuses on cost reduction and product design efficiency.
- Uses **Kaizen (continuous improvement)** for cost minimization.

✅ **Benefits:**

- Ensures profitability at market-competitive prices.
- Promotes innovation and process improvement.

⚠️ **Limitations:**

- May require redesigning operations or products.
- Difficult to apply to custom or unique products.

🔹 **E. Strategic Decisions**

Standards may need adjustment for **strategic changes**, such as:

- Replacing old machinery with advanced technology.
- Implementing Kaizen or continuous improvement initiatives.
- Shifting to automation or digital control systems.

⚙️ **2. Variance Analysis Concepts**

🌞 **Definition:**

Variance = Actual Results – Budgeted (or Standard) Results
It measures how actual performance differs from planned performance.

Purpose:
To identify causes of performance deviations for corrective or improvement actions.

🧩 **Meaning of "Budget" and "Standard"**

Both terms refer to *planned or expected amounts* used for comparison.

🔍 **Distinctions in Context**

Term	Definition	Usage
Budget	A financial plan that estimates total costs, revenues, and activity levels for a future period	Used for overall planning and control across departments
Standard	A per-unit estimate of cost or input (e.g., cost per unit of material or labor hour)	Used for setting benchmarks in cost accounting and variance analysis

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🚻 **Levels of Variance Analysis**

Variance analysis can be conducted at different *levels* of detail:

Level	Variance Type	Scope	Detail Provided
Level 1	Static Budget Variances	Total (global)	Lowest detail
Level 2	Flexible Budget & Sales Volume Variances	Separated by activity level	Medium detail
Level 3	Manufacturing Input Variances	By individual input (DM, DL, OH)	Highest detail

Key Rule:
Each higher level of analysis gives **more detailed insight** into the causes of variance.

🪨 **3. Static Budget Variances (Level 1)**

Static Budget:

- Prepared for one **fixed level of activity**.
- Does not change even if actual activity differs.

Formula:
👉 **Static Budget Variance = Actual Results – Static Budget**

✅ **Benefits:**

- Identifies unexpected differences in overall performance.
- Helps trigger further investigation (management by exception).
- Useful part of the **control process**.

⚠️ **Limitations:**

- Doesn't separate the effects of activity volume changes.
- Focuses on short-term results, not long-term success.
- Should be combined with non-financial measures (e.g., **Balanced Scorecard**).

Example: Static Budget Variance (Income Statement Format)

Item	Actual ($)	Static Budget ($)	Variance (A–B)	F/U
Revenues	2,500,000	2,880,000	(380,000)	U
Direct Materials	1,243,200	1,440,000	(196,800)	F
Direct Labor	384,000	396,000	(12,000)	F
Variable OH	261,000	288,000	(27,000)	F
Fixed Costs	570,000	552,000	18,000	U
Operating Income	**29,800**	**216,000**	**(186,200)**	**U**

🧾 Rules:

- **Revenues:**
  - Positive variance → Favorable
  - Negative variance → Unfavorable
- **Costs:**
  - Positive variance → Unfavorable
  - Negative variance → Favorable

👉 **Always use:**
Variance = Actual – Budget

📊 **4. Flexible Budget Variances (Level 2)**

Flexible Budget:
Adjusts budgeted revenues and variable costs to match the **actual activity level**.

Formula:

- **Flexible Budget Variance** = Actual Results – Flexible Budget
- **Sales Volume Variance** = Flexible Budget – Static Budget

Characteristics:

- Fixed costs remain unchanged (within relevant range).
- Variable costs are adjusted for the actual level of output or sales.
- More useful than static variances for performance evaluation.

Level 2 Variances include:

1. **Flexible Budget Variance** → Difference due to factors *other than* volume.
2. **Sales Volume Variance** → Difference due to *volume changes*.

While **volume** (i.e., number of units produced or sold) is a major cost driver, it's not the only one.
Factors other than volume include:

- **Input prices** (e.g., cost per unit of material or labor)
- **Efficiency levels** (e.g., how much input is used per unit)
- **Downtime or waste** (e.g., machine breakdowns, scrap)
- **Learning curve effects** (e.g., productivity improvements over time)
- **Process changes or technology upgrades**
- **Policy or procedural shifts** that affect operations

📘 **Example:**

If sales were below budget but within relevant range:

- Fixed costs remain same ($552,000).
- Variable costs and revenues adjusted to actual sales.

Flexible Budget Variance helps identify operational causes
(e.g., inefficiency, price changes).

Sales Volume Variance explains demand-related differences
(e.g., sales drop due to competition or market factors).

🧾 **5. Level 3 Variances — Most Detailed**

Level 3 focuses on **input-based variances** for manufacturing and sales.

🏭 **Manufacturing Input Variances**

Category	Type of Variance
Direct Materials	1. Price Variance 2. Quantity (Usage/Efficiency) Variance 2a. Mix Variance* 2b. Yield Variance*
Direct Labor	3. Rate (Price) Variance 4. Efficiency (Quantity) Variance 4a. Mix Variance* 4b. Yield Variance*
Variable Overhead	5. Total Variable OH Variance 5a. Spending Variance 5b. Efficiency Variance
Fixed Overhead	6. Total Fixed OH Variance 6a. Budget (Spending) Variance 7. Production-Volume Variance

*Mix and yield variances apply **only when more than one input** is used.

🛍️ Sales Variances

Category	Type of Variance
Sales Variances (Level 2)	8. Flexible Budget Variance 8a. Sales Volume Variance
Sales Mix & Quantity (Level 3)	8a. Quantity Variance** 8b. Mix Variance**

**Applicable only if more than one product is sold.

🧩 6. Key Insights

- **Level 1** → "What happened?"
- **Level 2** → "Why did it happen?"
- **Level 3** → "Which factor caused it specifically?"
- **Flexible budgets** provide more accurate, fair performance comparisons than static budgets.
- **Variance analysis** is part of management's control and continuous improvement process.

Direct Material Variances

🏭 1. Manufacturing Input Variances Overview

Definition:

Manufacturing input variances analyze the **inputs to the production process**—Direct Materials (DM), Direct Labor (DL), and Manufacturing Overhead (OH).

They measure:

1. **Quantity (Efficiency/Usage Variance)** → Did we use more or less input than the standard allowed?
2. **Price Variance** → Did we pay more or less per unit of input than expected?
3. **Total Variance** → What's the total monetary impact?

📋 **Purpose:**

- To **control production** and evaluate efficiency.
- Variances are reported on a **Production Variance Report**, not an income statement, because they're based on *units produced*, not *units sold*.

⚖️ **Accounting Treatment:**

At period-end, variances are **closed to Cost of Sales** or, if material, **prorated among:**

- Cost of Sales
- Finished Goods Inventory
- Work-in-Process (WIP) Inventory
- Direct Materials Inventory (for DM variances only)

🔁 2. Sales Variances vs Production Variances

Aspect	Sales Variances (Level 2)	Production Variances (Level 3)
Based On	Units **sold**	Units **produced**
Includes	Total flexible budget variance (price + quantity combined) **	Separate input price and quantity variances
Report Type	Sales Variance Report	Production Variance Report
Reconciliation	Possible **only if** units produced = units sold (e.g., new firm with zero beginning inventory)	Not otherwise reconcilable
Information Detail	Combined variance	Separated into price & quantity

🔸 **Key Rule:** Don't try to reconcile Level 2 and Level 3 reports unless the question *explicitly* says the units produced = units sold.

**[It combines the effects of:

- **Price variance**: Difference due to actual price vs standard price
- **Quantity variance**: Difference due to actual volume vs expected volume]

💡 3. Causes of Input Cost Variances

Variance arises when **Actual Cost ≠ Budgeted Cost**, caused by:

- Paying a different **price** per unit of input, or
- Using a different **quantity** of input for the actual output, or both.

Management Needs to Know:

- Was it a **price difference**?
- Was it a **usage difference**?
- Was it **both**?

🧮 4. Types of Manufacturing Input Variances

Type	Meaning	Formula	Alias
Price Variance	Difference between actual price and standard price per unit of input.	**(AP – SP) × AQ**	Price (Usage) Variance
Quantity Variance	Difference between actual and standard quantity used for actual output.	**(AQ – SQ) × SP**	Efficiency / Usage Variance
Total Variance	Combined impact of price and quantity.	**(AP × AQ) – (SP × SQ)**	Flexible Budget Variance

Note:
✅ **Total Variance = Price Variance + Quantity Variance**

⚙️ 5. Direct Materials Variances

📌 Total Direct Materials Variance

Measures the overall difference between what was *actually spent* and what *should have been spent* for the actual output.

Formula:

(AP×AQ)−(SP×SQ)

Interpretation:

- Positive → Unfavorable (U)
- Negative → Favorable (F)

Example:
Medina Co. makes footballs.

- Standard: 1 sq. meter of leather @ $5 each
- Produced: 250 footballs
- Used: 290 sq. meters
- Actual Price: $4.50 per meter

Total DM Variance=(4.5×290)−(5×250)=1305−1250=55U\text{Total DM Variance} = (4.5×290) - (5×250) = 1305 - 1250 = 55UTotal DM Variance=(4.5×290)−(5×250)=1305−1250=55U

🧻 Medina spent $55 more than it should have for 250 footballs.

📦 6. Direct Materials Quantity (Usage/Efficiency) Variance

Formula:

(AQ−SQ)×SP

or

(AQ×SP)−(SQ×SP)

Meaning:
Cost difference due to using *more or less material* than standard allows (at standard price).

Example (Medina):

- AQ = 290
- SQ = 250
- SP = $5

(290−250)×5=200U

→ Used 40 sq. meters more than expected.

⚠️ Causes of Unfavourable Quantity Variance

- Poor quality materials
- Defective machinery
- Poor design or high spoilage
- Theft or waste
- Inexperienced/untrained workers
- Overtime fatigue

- Rush orders disrupting process

✅ **Causes of Favourable Quantity Variance**

- Better material quality
- Improved design (less material needed)
- Skilled workers / improved training
- Standards outdated (need revision)

💰 **7. Direct Materials Price Variance**

Formula:

(AP–SP)×AQ

or

(AP×AQ)−(SP×AQ)

Meaning:
Measures effect of paying more or less per unit of material than standard allows.

Example (Medina):

- AP = $4.50
- SP = $5
- AQ = 290

(4.5−5)×290=(−0.5)×290=145F

✅ Medina saved $145 by paying $0.50 less per meter.

⚠️ **Causes of Unfavourable Price Variance**

- Market price increases not updated in standards
- Inexperienced purchasing staff
- Rush purchases or small order quantities

✅ **Causes of Favourable Price Variance**

- Market prices fell
- Better supplier negotiation
- Bulk discounts / improved purchasing research

🛒 **8. Materials Purchase Price Variance**

📘 **Definition:**

A variation of the materials price variance, computed **at purchase time** (not at usage).

Formula (same as price variance):

(AP–SP)×AQ

But **AQ = Quantity Purchased** (not quantity used).

✅ **Benefits:**

- Allows earlier detection and correction of purchase problems.
- Provides better cost control.

🧠 **Exam Tip:**

If question says...	Use this formula setup
"Materials price variance"	Use **quantity used** as AQ
"Materials purchase price variance" OR "Company recognizes variances early"	Use **quantity purchased** as AQ

🧩 **9. Exam Strategy — Algebraic Solving**

Be able to solve **for any variable** in the variance formula.

Example (Direct Materials Price Variance):

(AP–SP)×AQ=Price Variance

If variance and two variables are given, solve for the missing one (AP, SP, or AQ).

⚖️ **10. Relationship Between Variances**

Total Variance = Price Variance + Quantity

Always check your calculations for this equality — it must hold true if all values are correct.

🧭 **11. Management by Exception**

Variance analysis is a key tool for **management by exception**.

Variance Type	Action
Unfavourable	Investigate and correct causes.
Favorable	Investigate to identify positive improvements that can be replicated.

Both types deserve review — ignoring favorable variances may miss improvement opportunities.

🪵 12. Quick Summary Table

Variance	Formula	Indicates	F/U Rule
Total DM Variance	(AP×AQ) – (SP×SQ)	Overall difference	+U / –F
Quantity (Usage) Variance	(AQ – SQ) × SP	Material efficiency	+U / –F
Price Variance	(AP – SP) × AQ	Price per unit difference	+U / –F
Purchase Price Variance	(AP – SP) × AQ (purchased)	Early detection of price difference	+U / –F

🧠 **Memory Tip:**

"A Smart Quick Analysis" → (A – S) × Q / (A – S) × P

- *A* = Actual
- *S* = Standard
- *Q* = Quantity
- *P* = Price

Direct Labor Variances

Direct labor variances analyze **the difference between actual and standard labor costs** for producing a given level of output.

Formula for Total Direct Labor Variance:

Total Direct Labor Variance=(Actual Labor Cost)−(Standard Labor Cost for Actual Output)

Or:

(AP×AQ)−(SP×SQ)

Where:

- **AP** = Actual rate per hour
- **SP** = Standard rate per hour
- **AQ** = Actual hours worked
- **SQ** = Standard hours allowed for actual output

⚙️ **Types of Direct Labor Variances**

1️⃣ **Direct Labor Rate Variance (Price Variance)**

Measures the effect of paying a different **hourly wage rate** than the standard.

Formula:

(Actual Rate−Standard Rate)×Actual Hours

or

(AP–SP)×AQ

Interpretation:

- **Positive (Unfavorable):** Actual rate > Standard rate → Paid more per hour
- **Negative (Favorable):** Actual rate < Standard rate → Paid less per hour

📘 **Meaning:**
Shows whether labor was paid at a rate higher or lower than planned.

💡 **Causes of Unfavorable Labor Rate Variance**

- Renegotiated union wage contracts (higher wages not reflected in standard)
- Inaccurate labor rate projections
- Using a single average standard rate that doesn't match actual labor mix
- Assigning higher-skilled (more expensive) workers than planned

💡 **Causes of Favorable Labor Rate Variance**

- Lower wage rates than standard (may mean less qualified workers)
- Using lower-paid workers temporarily

⚠️ **Caution:** Favorable labor rate variances may lead to lower productivity and poor-quality output → higher defect or warranty costs.

2️⃣ **Direct Labor Efficiency Variance (Quantity Variance)**

Measures how efficiently labor time was used.

Formula:

(Actual Hours−Standard Hours for Actual Output)×Standard Rate

or

(AQ–SQ)×SP

Interpretation:

- **Positive (Unfavorable):** Used more hours than expected → inefficient
- **Negative (Favorable):** Used fewer hours than expected → efficient

- **Here we calculating cost, So when cost is more (positive) inefficient, negative efficient.**

📘 **Meaning:**
Shows whether labor hours were used efficiently compared to standard.

💡 **Causes of Unfavorable Labor Efficiency Variance**

- Inexperienced or untrained workers
- Poor quality materials causing rework or delay
- Frequent equipment breakdowns
- Poor supervision or scheduling issues
- Low worker morale or excessive overtime

💡 **Causes of Favorable Labor Efficiency Variance**

- More skilled or better-trained workers
- Improved methods or tools
- Better supervision and work planning
- Use of highly skilled employees (may cause unfavorable rate variance)

🪫 **Accounting for Direct Labor Variances**

📘 **Journal Entry at Production:**

Dr. Work-in-Process Inventory (Standard Hours × Standard Rate)

Dr./Cr. Labor Rate Variance

Dr./Cr. Labor Efficiency Variance

Cr. Accrued Payroll (Actual Hours × Actual Rate)

- **Unfavorable → Debits**
- **Favorable → Credits**

⚖️ **At Period End:**

- Variances are closed to **Cost of Goods Sold (COGS)**
  or
- If material, prorated among:
  - Work-in-Process (WIP)
  - Finished Goods
  - COGS
    🟡 *Note: Direct materials inventory is **not** included in this proration.*

Variances are only prorated to accounts that reflect **production activity**. **Direct materials inventory** is excluded because it represents **unused inputs**, not yet part of the manufacturing flow.

✅ **What's Included in Proration?**

When variances (like labor or overhead) are **prorated**, they're distributed across:

- **Work-in-Process (WIP) Inventory** → includes **used direct materials** still in production
- **Finished Goods Inventory** → includes **used direct materials** in completed products
- **Cost of Goods Sold (COGS)** → includes **used direct materials** in sold products

So yes—**used direct materials** absolutely flow through these accounts and **do participate in proration**.

❌ **Unused direct materials** (raw materials inventory) are **excluded** from proration because they haven't been affected by production variances.

🧩 **Key Differences from Direct Materials Variances**

Aspect	Direct Materials	Direct Labor
Timing of variance	Can be at purchase or use	Always at use
Storage	Materials can be stored	Labor cannot be stored
Additional variance	Purchase price variance possible	No equivalent for labor
Proration includes	DM Inv., WIP, FG, COGS	Only WIP, FG, COGS

🎯 **Exam Tips**

- Remember **AP × AQ – SP × SQ** pattern.
- **Rate variance** → Price difference; **Efficiency variance** → Usage difference.
- A **positive variance (U)** means higher cost; **negative variance (F)** means cost saving.
- Be ready to **solve for unknowns (AP, SP, AQ, SQ)** algebraically using the formulas.
- Know **causes and corrective actions** — management-by-exception approach applies here too.

🧠 **Quick Recap Formulas**

Variance Type	Formula	Meaning
Total Direct Labor Variance	(AP×AQ) – (SP×SQ)	Total difference in labor cost

Variance Type	Formula	Meaning
Labor Rate Variance	(AP − SP) × AQ	Difference due to wage rate
Labor Efficiency Variance	(AQ − SQ) × SP	Difference due to hours used

Multiple Input or Multiple Class Variances

🌼 **Overview**

When a product uses **more than one direct material input** or **more than one class of labor**, we call it a **mix of inputs**.

For such cases:

- We still calculate **total**, **price**, and **quantity (efficiency)** variances.
- But the **quantity variance** is further divided into:
    1. **Mix Variance**
    2. **Yield Variance**

⚙️ **Total Variance of a Weighted Mix**

Total Variance=(AP × AQ)−(SP × SQ)

Where:

- **AP** = Actual Price (or Rate)
- **AQ** = Actual Quantity (or Hours)
- **SP** = Standard Price (or Rate)
- **SQ** = Standard Quantity (or Hours allowed for actual output)**

This formula applies both for **materials** and **labor**.

🧮 1️⃣ **Price (Rate) Variance for a Weighted Mix**

Calculated **individually for each component** of the mix.

Price Variance=(AP−SP)×AQ

Then, sum all individual variances for the **total mix price variance**.

🧮 2️⃣ **Quantity (Efficiency) Variance for a Weighted Mix**

Also calculated for each input separately:

Quantity Variance=(AQ−SQ)×SP

Then, sum all individual results to find the **total materials quantity** or **labor efficiency variance**.

📘 Example (Dog Food Co.):

Ingredient	AQ	SQ	SP	Variance Formula	Result
Beef	2,547	2,700	$2.00	(2,547−2,700)×2	$(306) F
Spinach	1,725	1,485	$1.00	(1,725−1,485)×1	$240 U
Pumpkin	1,200	1,065	$0.20	(1,200−1,065)×0.20	$27 U

Total materials quantity variance = $(306) + 240 + 27 = $ (39) Favorable**

Even though more material was used in total, the **variance was favorable** due to cheaper mix composition.

🧩 **Why Split the Quantity Variance?**

Because when multiple inputs exist, a total quantity variance **does not show whether**:

- The **mix (proportions)** of inputs was different, or
- The **total input usage (yield)** was different.

Hence, we separate:

1. **Mix Variance** → Change in proportions
2. **Yield Variance** → Change in total input volume

⚖️ 3️⃣ **Mix Variance**

Shows the effect of using a **different ratio of inputs** than the standard.

Formula:

(WASPAM−WASP SM)× AQ total

Where:

- **WASP** = Weighted Average Standard Price (or Rate)
- **AM** = Actual Mix
- **SM** = Standard Mix
- **AQ total** = Total actual quantity of all inputs used

🔹 **Step 1: Weighted Average Standard Price (WASP)**

(a) WASP of the Actual Mix (WASP_AM)

(AQ1×SP1)+(AQ2×SP2)+.../Total Actual Quantity (all inputs)

Represents what **1 unit of the actual mix should have cost** (based on standard prices).

Calculated **after** the reporting period (actual usage known).

(b) WASP of the Standard Mix (WASP_SM)

(SQ1×SP1)+(SQ2×SP2)+.../Total Standard Quantity (all inputs)

Represents what **1 unit of the standard mix** should have cost.

Can be calculated **before** the period begins.

🔹 **Step 2: Calculate the Mix Variance**

Mix Variance=(WASPAM−WASPSM)×AQ total

Interpretation:

- **Favorable:** Actual mix used more of cheaper materials/labor
- **Unfavorable:** Actual mix used more of expensive materials/labor

📘 Analogy:
Mix variance works like a **price variance**, but instead of changing prices, we change **proportions** of inputs while keeping the standard prices constant.

🎂 🦶 **Yield Variance**

Shows the effect of **using a different total quantity** of inputs than the standard allowed for actual output.

Formula:

(AQ total−SQ total)×WASPSM

Where:

- **AQ total** = Total actual inputs used
- **SQ total** = Total standard inputs allowed for actual output
- **WASP_SM** = Weighted average standard price of standard mix

Interpretation:

- **Favorable:** Less total input used than expected for given output
- **Unfavorable:** More total input used than expected

📘 Analogy:
Yield variance works like a **quantity variance**, but for **the total input volume**, not individual components.

🧠 **Conceptual Recap**

Type of Variance	Formula	What It Measures	F / U When
Total Variance	(AP×AQ) − (SP×SQ)	Total cost difference	Depends
Price (Rate)	(AP − SP) × AQ	Change in cost per unit	Actual price ↑ = U
Quantity (Efficiency)	(AQ − SQ) × SP	Change in usage	More input used = U
Mix	(WASP_AM − WASP_SM) × AQ_total	Change in proportion of inputs	More expensive mix = U
Yield	(AQ_total − SQ_total) × WASP_SM	Change in total inputs	More total inputs = U

📓 **Responsibility for Variances**

- **Mix Variance:** Person who controls or authorizes material/labor substitutions.
- **Yield Variance:** Production manager or supervisor controlling efficiency and waste.

Sometimes someone close to production but not the decision-maker may explain the causes.

⚡ **Key Notes for Exams**

✅ Mix and Yield Variances apply **only** when there are **multiple inputs or labor classes**.
✅ When there's only **one input or labor type**, **no mix or yield variance** is calculated.
✅ Remember:

- Mix variance isolates **ratio differences**.
- Yield variance isolates **total usage differences**.
  ✅ HOCK abbreviations:
- **WASP_AM** = Weighted Average Standard Price of Actual Mix
- **WASP_SM** = Weighted Average Standard Price of Standard Mix